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China's Growth and Poverty Reduction

Trends between 1990 and 1999

Shaohua Chen
Yan Wang

During the 1990s, China's poverty declined significantly across a wide range of poverty lines. China's poor have benefited much less from economic growth than the rich. Education is positively and significantly related to growth and poverty reduction—but the regional disparities of education are widening. Education must be more equitably distributed if China is to attack poverty and inequality.

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Summary findings

Chen and Wang investigate recent trends in poverty and inequality in China, decomposing data on poverty reduction to see who has benefited most from China's economic growth. They find that, by several measures, poverty declined significantly in the 1990s, across a wide range of poverty lines, except that a slight slowdown in China's export and economic growth in 1997–99 might have hurt the poor. There was a slight increase in the poverty headcount between 1997 and 1999, using lower poverty lines, and a worsening of the poverty gap index. Average per capita consumption declined for farmers, especially those living in poor regions such as Gans, Heilongjiang, Shanxi, and Xinjiang. It is unclear whether this decline was attributable to Asia's economic crisis.

Economic growth contributed significantly to poverty reduction, but rising inequality worsened both rural and urban income distributions—except during the Asian crisis when the distribution remained relatively stable.

The poor benefited far less than the rich from economic growth. Income growth reached or exceeded the average growth rate only for the richest 20 percent of the population.

Chen and Wang then examine the relationship between human capital, growth, and poverty. They find that the accumulation of human capital had slowed and that there is a huge regional disparity in human capital stock. And the distribution of education is becoming increasingly skewed. China must address this problem if it is to succeed in attacking poverty and inequality.

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1. Introduction

China's record of economic growth and poverty reduction has been extraordinary in the 1980s and 1990s. In the two decades since the economic reform started, the economy has grown more than fivefold, the average income per capita has quadrupled, and 270 million Chinese have been lifted out of absolute poverty.[1] Elsewhere in the world, by contrast, the record of poverty reduction is disappointing: Using the World Bank one-dollar-a-day poverty line (in 1993 PPP term) and excluding China, at least 100 million more people are living in poverty today than a decade ago. Including China, the total number of poor remained about the same in 1998 as in 1987, although the proportion of poor in population reduced from 28 percent to 24 percent.[2]

What makes the huge difference between China's record and the rest of the world? What are the sources of China's growth and accompanying reduction of absolute poverty? To what extent has China's growth benefited the poor, and under what conditions? These questions have been at the center of many studies and subject to heated debates. This paper attempts to contributing to the current debated by, first, investigating the recent trends in poverty and inequality since the 1990, distinguishing between the pre-crisis and the after-crisis periods; second, decomposing poverty reduction due to growth and the changes of income distribution; third, finding out who has benefited most from China's remarkable economic growth and fourth, examining the relationship among human capital, growth and poverty reduction based on our past studies, thereby assessing the impact of various pro-growth factors.

There is a heated debate on what type of growth is pro-poor growth, and to what extent do poor share the benefits of growth, and under what conditions.[3] On the one hand, some studies have found that there is almost a one-to-one relationship between average

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[1] The Economist, March 10,2001 p.23.

[2] This was according to an international poverty line, population living below $1.08 per day at 1993 PPP dollar. See Chen and Ravallion 2000 for details.

[3] See for example, Easterly 1999a, Ravallion and Datt 1999, Dollar and Kraay, 2000, Thomas et al 2000, and World Bank 2000/01.

growth and the income growth of the poorest 20 percentile, assuming inequality constant (Dollar and Kraay 2000). On the other hand, countries with similar incomes and growth over the past three decades have achieved widely differing outcomes in education, health, and environmental protection (Easterly 1999a, Thomas et al 2000). The impact of growth on poverty has also varied enormously. Among India's 15 major states, a certain growth rate has been associated with poverty reduction three to four times as much in some states than in others (Ravallion and Datt 1999). Using data from 15 Indian states between 1960 and 1994, they found that the poverty reducing impact of growth varied according to initial conditions: growth contributed less to poverty reduction in states with initial lower literacy rates, farm productivity and rural standard of living relative to urban areas.

To contribute to the important debate, we decompose China's poverty reduction into two parts: a part due to economic growth, and another part due to changes in inequality. Then we investigate whether everyone benefits at the same rate from the economic growth. Later, we look at the determinants of China's growth using a simple growth accounting framework, linking factors such as human capital and its distribution to poverty reduction. Given the data limitations (no access to the household level data), this is only a preliminary exercise in analyzing the issue at hand--that is, under what conditions growth is pro-poor. We will continue this effort in the next few years.

The structure of the paper is as follows: Section 2 investigates the trends in poverty and inequality in China, distinguishing between the pre-crisis (1990-96) and post-crisis (1997-99) periods. In Section 3, we decompose poverty reduction into two parts and look at income growth rates by various income groups. In section 4, we examine relationship between human capital, growth and poverty, drawing from our recent papers on the sources of growth, incorporating a new measure of human capital (Wang and Yao 2001). By constructing a measure of human capital stock and looking into the distribution of human capital, we find large regional disparities which are a matter of concern. Section 5 summarizes our findings.

2. Recent Trends in China's Poverty and Inequality

Many previous studies have examined past progress in China's poverty and income distribution.[4] There is a consensus among these studies that, even though about 270 million people were lifted out of poverty since the reforms started in 1978, the benefits of growth are unevenly distributed. Inequalities in income and consumption have been worsening, especially in the recent years. The Gini coefficient, a low 28.8 in 1981, reached 41.5 in 1995, a level similar to that of the United States. The rural-urban divide is increasing, regional disparities are widening and access to opportunities is becoming less equal (World Bank, 1997b).

[4] See for example, Ahmad and Wang 1991, Chen and Ravallion 1996, Khan, Griffin, Riskin and Zhao 1993, Howes and Hussain 1994, Hussain, 2000 (urban), Knight and Song 1993, Jalan and Ravallion 1997, Ravallion and Chen, 1998, World Bank 1997b, and 2000, among many others.

In this section, we employ the standard methodology as described in Ravallion (1992), and examine China trends in poverty and in income distribution. China's urban and rural household surveys cover more than 100,000 households. Unfortunately, we do not have access to the household level data for the recent years. In this study we use grouped income/consumption distribution data from rural and urban household surveys in 1990-1999 to generate parametric Lorenz functions, then estimate the poverty measures and Gini index. (See Chen, Datt and Ravallion 1991 and Datt 1991 for methodology.)

Poverty Trends

We first calculate the head-count index over time. As is well known, head-count index of poverty is given by the proportion of the population for whom consumption (or another suitable measure of living standard) y is less than the poverty line z. We use consumption expenditure as the welfare indicator here and all the poverty measures giving below are consumption based. However, since we do not have completely time series of consumption expenditure distributional data for both rural and urban areas during 1990 to 1999, we have to rely on the income distributions to compare poverty over time. As discussed in Chen and Ravallion 2000, we adjust the income Lorenz curve by replacing the overall mean per capita income by mean consumption from the same survey. In general an income distribution has higher inequality than a consumption distribution but in China we have found the opposite: the consumption Gini is higher than income Gini (see Table A4 in Annex I) . That is because China's household survey records the housing and other durable goods expenditure as one time consumption instead of a long-term consumption. The Gini would drop when correcting the recording method. (see Chen and Ravallion 1996). One could find from Table A3 in Annex I that there is no basis for this adjustment on the poverty trend.

Table 1 shows the rural, urban and national headcount index from 1990 to 1999, using various poverty lines. Column 1 shows the poverty line in PPP dollar per day, followed by headcount index. Our findings are as follows. [See Table A1 for headcount based on consumption expenditures selected years].

- First, poverty incidence has dropped significantly in the period of 1990 to 1999. Using a lower poverty line of $0.75 per day (little higher than the official poverty line), the headcount index decreased from 17.1 percent to 8.9 percent. Using a World Bank international poverty line ($1 per day), the headcount index decreased from 31.5 percent to 17.4 percent. This means, 14 million of people were lifted out of poverty.
- Second, between 1990 and 1993, poverty changes were insignificant if using lower poverty lines, and more significant using higher poverty lines. This is consistent with the fact there is a significant increase in inequality during the same period (see next section on gini index).
- Third, poverty reduction was more significant in the period from 1993-96, especially for rural poverty. The most important causes of this significant reduction is that the Chinese government increased the purchasing price of agriculture products by 75 % especially grain. The official purchasing prices of grain has been doubled during 1993 to 1996. From another study (The World Bank 1997) we know that the share of grain income decline from the poor to rich so the increase of grain price has benefited the

poor and near poor (around $0.75 to $1 per day poverty lines) and the middle income group most.

- Four, the incidence of poverty rose quite significantly in 1998 and 1999, after the full impact of the Asian crises has been felt. China has weathered the financial storm well, but the economic slowdown hurts the poor. Using the lower poverty line ($0.75/day), the incidence of poverty rose from 8.4 to 8.9 percent. Using a higher poverty line, poverty incidence rose from 17.0 to 17.4 percent. Poverty does not increase if a poverty line higher than $1.5/per day is used. This implies that the economic slowdown really hurts the most vulnerable people at the bottom of income distribution.

Table 1. Trend in Poverty headcount, Rural, Urban and National, 1990-99

China: Rural headcount index (based on income distribution)

Poverty Line z/day	1990	1992	1993	1994	1995	1996	1997	1998	1999
0.50	7.1	7.1	7.7	7.4	6.2	3.4	4.1	3.7	4.0
0.75	23.3	23.3	22.9	20.6	17.6	11.9	12.4	12.0	12.7
1.00	42.5	40.6	40.6	34.6	30.8	24.1	24.0	24.1	24.9
1.25	60.3	57.6	56.4	50.2	44.7	37.1	36.6	37.2	37.7
1.50	73 4	70.8	68.9	63.9	57.4	49.2	48.4	49.4	49.6
1.75	82.1	79.8	78.0	74.3	67.8	59.9	59.0	60.1	60.0
2.00	87.6	85.7	84.4	80.3	75.8	68.7	67.9	69.0	68.7
2.25	91.1	89.6	88.7	85.6	81.6	75.9	75.2	76.2	75.7
2.50	93.5	92.2	91.7	89.4	85.8	81.5	80.9	82.0	81.2

China: Urban headcount index (based on income distribution)

z/day	1990	1992	1993	1994	1995	1996	1997	1998	1999
0.50	0	0	0	0	0	0	0	0	0
0.75	0	0	0.3	0.3	0.3	0.2	0.2	0.0	0.2
1.00	1.0	0.8	0.7	0.9	0.6	0.5	0.5	1.0	0.5
1.25	4.3	1.8	1.8	2.1	1.4	1.1	1.2	1.9	1.1
1.50	8.6	3.9	4.2	4.6	3.0	2.6	2.7	3.4	2.2
1.75	14.0	7.6	8.2	8.5	5.8	5.4	5.4	5.8	4.1
2.00	20.7	13.2	13.8	13.5	9.7	9.3	9.1	9.0	6.8
2.25	28.7	20.3	20.2	19.1	14.6	14.2	13.7	12.9	10.3
2.50	37.8	28.4	27.1	25.1	20.1	19.6	18.8	17.4	14.3

China: National headcount Index (based on income distribution)

z/day	1990	1992	1993	1994	1995	1996	1997	1998	1999
0.50	5.2	5.1	5.5	5.3	4.4	2.4	2.9	2.6	2.8
0.75	17.2	16.8	16.6	14.8	12.6	8.4	8.7	8.4	8.9
1.00	31.5	29.6	29.4	25.0	22.0	17.2	17.0	17.1	17.4
1.25	45.5	42.2	41.1	36.4	32.1	26.5	26.0	26.4	26.4
1.50	56.3	52.3	50.7	47.0	41.6	35.5	34.8	35.4	35.0
1.75	64.1	59.9	58.4	55.5	49.8	43.8	42.9	43.6	42.7
2.00	69.9	65.7	64.5	61.2	56.6	51.3	50.3	50.7	49.6
2.25	74.7	70.5	69.4	66.6	62.1	57.8	56.8	56.9	55.5
2.50	78.8	74.5	73.5	71.0	66.7	63.3	62.3	62.3	60.5

Source: Authors' calculation. Note: Since the World Bank's international poverty line is about $1.08 a day in 1993 PPP term. Here $1/day is actually $1.08/day; $0.50/day is 0.5 *$1.08/day and so on.

As is well known, the poverty headcount index is insensitive to the differences in the depth of poverty. If the poor suddenly become poorer during a crisis, nothing will change in the headcount index. Therefore, we have to go further by examining the poverty gap measure. The poverty gap is based on the aggregate poverty deficit of the poor relative to the poverty line, which gives a good indication of the depth of poverty since it reflects the average distance of the poor's income from the poverty line (Ravallion 1992).

As with the headcount index, we found that the poverty gap index improved from 1990 to 99.

- According to the lower poverty lines (from 0.75 to one dollar a day), from 1990-93 the index rose slightly, then declined sharply in 1993-96, and rose again from 1996-99. For higher poverty lines, the poverty gap index declined in 1990-93 as well as in 1993-96.
- During the Asian crises, the poverty gap index rose for all poverty lines between 1996 and 1999.
- Based on our estimates of the poverty gap, it will need RMB 101 billion Yuan at 1999 prices, to lift the poor above the absolute poverty line (about $0.75 per day). Similarly it will cost RMB 854 billion Yuan to lift the poor above the $1 per day poverty line.

See annex 1 for tables on poverty gap.

Changes in Inequality

Next, we investigate the changes in income inequality. The Gini index has been widely used to measure inequalities in income and wealth, including land. It can also be used to measure inequalities in education attainment. This latter point will be discussed in Section 4.

Income disparities in China come largely from two sources: income gaps between rural and urban sectors; and those between coastal and inland regions. We first calculate Gini indexes for both rural and urban areas, and then the national level Gini indexes are calculated using different assumptions. First we assume that the cost of living difference between rural and urban areas is zero (CLD=0). Second, we assume that the urban cost of living is 10 percent higher than that for rural areas (CLD=10%). Lastly we assume it to be 20 percent (CLD=20%). The findings are as follows.

- First, during the period from 1990 to 1999, there was a significant worsening of both rural and urban income distributions. The rural gini index rose by 4.04 percentage points, while the urban gini rose by even more, over 6 percentage points.
- On the national level, assuming no difference between the rural and urban cost of living (CLD=0), the national income distribution worsened more significantly, with the gini index ring from 34.84 to 41.64, representing a 6.8 percentage increase.
- Income inequality worsened significantly in the early 1990s, between 1990 and 1994, reaching a peak in 1994 of 43.34 percent (CLD=0). It then declined between 1995 and 1997 when the economy start to slow down. During the Asian crises, inequality remained rather stable, with only a small rise in 1999. This trend is consistent with what happened in other East Asian countries.

- Assuming a significant cost of living differences between urban and rural areas (if CLD=20 percent), the changes in national income distribution are less dramatic, from 32.14 to 38.59 percent, a 6.45 percentage point rise. Nonetheless, this is still a significant worsening in income distribution.
- In sum, the trend in the change of inequality remains the same no matter what assumption we make in the cost of living difference. However, the calculated level of inequality is lower by 1 to 2 percentage points when we incorporate a significant cost of living difference. Furthermore, had we considered the CLD between coastal/inland regions, that would have brought the gini index down further . For details see Chen and Ravallion, (1996). See Table 2 for gini indexes for income distribution, Table A4 for consumption distribution.

Table 2. Gini index of Income Distribution, Rural, Urban and National, 1990-99

Gini index (%) of income distributions

			National Gini		
	Rural Gini	Urban Gini	CLD=0	CLD=10%	CLD=20%
1990	29.87	23.42	34.84	33.34	32.14
1992	32.03	24.18	38.98	37.23	35.81
1993	33.70	27.18	41.96	40.18	38.71
1994	34.00	29.22	43.34	41.46	39.90
1995	33.98	28.27	41.51	39.84	38.46
1996	32.98	28.52	39.80	38.16	36.84
1997	33.12	29.35	39.79	38.21	36.92
1998	33.07	29.94	40.30	38.70	37.39
1999	33.91	29.71	41.64	39.97	38.59

Note: CLD is cost of living difference between rural and urban areas.
Source: Authors' calculation based on group data from household surveys. See Table A4 for gini index of consumption expenditure.

Changes in consumption expenditure

We examine the pattern of consumption expenditure over time, and find that since 1997, consumption expenditures in rural China have slightly declined. The real average per capita consumption expenditure for farmers dropped 1 percent in 1998. It is the first negative growth in consumption since the economic reform.

Table A5 in Annex 2 shows the changes of rural per capita consumption during 1996-1999 at provincial level and table A6 indicates the poverty incidences for 1996 by the provinces. Comparing these two tables, one could easily find that rural per capita consumption have dropped significantly for some province with high poverty incidence such as Gansu, Heilongjiang, Shanxi, and Xinjiang. As the consequence, rural poverty has increased during the same time.

Many domestic factors may have led to a decline in rural consumption, such as a decline in the relative prices of agricultural products, or weak domestic demand due to increased

uncertainty (strong incentive to save). Other evidence suggests that external factors such as a weak export demand may have played a role.

In summary, both internal and external factors have led to a slowdown in China's export and economic growth between 1997-1999, which in turn might have adversely affected the poor. There was an increase in the poverty headcount using lower poverty lines, and a worsening of poverty gap index. The real average per capita consumption declined for farmers, especially for those living in the poor regions. However, it remains unclear to what degree this decline was due to financial crises in Asia. Income inequality, on the other hand, has remained relatively stable during the Asian crisis, with the most significant worsening occurred in the early 1990s.

3. Decomposing Poverty Reduction

So far, we have seen the changes in poverty and inequality over time. A question remains unanswered: how much do the poor benefit from the rapid economic growth? To examine this issue, we decompose the poverty reduction into two parts, one due to growth, and the other due to changes in income distribution. Following the methods discussed in Ravallion (1992), we denote poverty headcount as a function of mean income and distribution at time t, $P(z/\mu_t, L_t)$ where μ is mean consumption given poverty line z; and L is the Lorenz curve or income/expenditure distribution at time t. The decomposition equation can be written as,

$$P(z/\mu_2, L_2) - P(z/\mu_1, L_1) = [P(z/\mu_2, L_1) - P(z/\mu_1, L_1)] + [P(z/\mu_1, L_2) - P(z/\mu_1, L_1)] + r$$

The left hand side is the poverty reduction between period 2 and 1. On the right hand side, the first part is the growth component assuming income distribution, L_1, remained constant. The second part is the redistribution component keeping mean consumption, μ_1, constant, and the last part, r, is the residual.

Table 3 shows the results of poverty decomposition, using various poverty lines, and differentiating by rural and urban sectors and different time periods. Here is what we found:

- First, growth played a positive and significant role in poverty reduction. This is true for both rural and urban sectors, and for all poverty lines and periods.
- The worsening of inequality in income distribution adversely affected the poor for the entire period: making poverty increase by 3.36 percent in rural areas using a $1 per day poverty line. If we divide the entire period into 3 sub-periods:

➢ Between 1990 and 1993 there was a significant worsening of income distribution which led to a bigger contribution of the redistribution component: poverty increased by 5.45 percent across all poverty lines.

➢ The period between 1993-96 was the best period for poverty reduction as well as distribution. For rural areas, the redistribution contributed positively to poverty reduction (as indicated by the negative sign) for all poverty lines.

- Between 1996 and 1999, there was an increase in the poverty headcount in both rural and urban areas. During the Asian crisis, growth slowed down and its contribution to poverty reduction was weak. The redistribution component contributed to an increase in poverty for all poverty lines.
- For urban areas, the redistribution component led to an increase in poverty across all periods and different poverty lines. For rural areas, the effect varies from one period to another, positive in period 1, negative in period 2, and positive in 3.

Table 3. Decomposition of Poverty Reduction, by different poverty lines, 1990-1999

		Actual Poverty Reduction	The growth component $1/day	The Redist. Component	Actual Poverty Reduction	The growth component $1.5/day	The Redist. Component	Actual Poverty Reduction	The growth component $2/day	The Redist. Component
1990-93	Rural	-1.87	-5.84	5 45	-4.57	-5.32	4.83	-3.24	-3	3.02
	Urban	-0.24	-0.15	1.06	-4.41	-4.95	6.51	-6.96	-9.98	13.13
1993-96	Rural	-16.52	-16.59	-0.74	-19.64	-18.48	-1.48	-15.62	-14.16	-0.82
	Urban	-0.25	-0.3	0.13	-1.54	-2.14	1.23	-4.44	-6.26	2.28
1996-99	Rural	0.8	-0.22	1.02	0.4	-0.29	0.69	0	-0.27	0.26
	Urban	0.03	-0.19	0.35	-0.48	-1.33	1.39	-2.5	-4.38	2.2
1990-99	Rural	-17.59	-22.39	3.36	-23.81	-26.52	-0.94	-18.86	-18.3	-0.96
	Urban	-0.46	-0.95	2.61	-6.43	-7.54	6.46	-13.9	-17.43	9.77

Note: A negative number indicates poverty reduction. A positive number, a poverty increase.
Source: Authors calculation.

Who benefits most from Economic Growth in China?

If we have household level data then it will be very easy to calculate the income growth rates cross the different income groups. However, it is also possible to do that based on the grouped distributions. Let L() represent the ordinary Lorenz curve, thus L(p) gives the share of income for the poorest p percent of the population and L'(p) is the first derivative of L(p). Then the average per capita income for the poorest p % is expressed by:

$$Mean(p)=L'(p) * overall\ mean$$

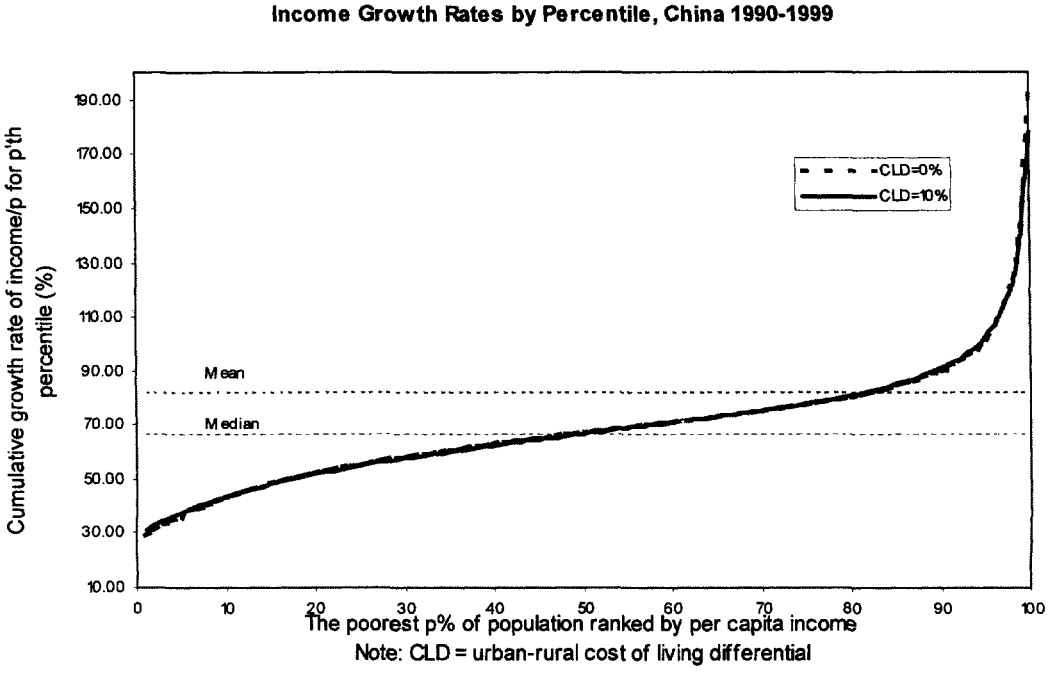
Over 1990 to 1999, the growth rate for the poorest p'th percentile is given by

$$r_p = [L'_{1999}(p) * overall\ mean\ in\ 1999]/[L'_{1990}(p) * overall\ mean\ in\ 1990]-1$$

Here the overall mean in 1990 and 1999 are in the constant price. As showing in Figure 1, income of the richer people grew much faster than the poor during 1990 to 1999. The average annual income growth rate is only 3 % for the bottom 1% people while the top 1% growth over 11% per year. In other word the richest one percent grows nearly four time faster then the poorest one percent! It was only the richest 20 percent people whose income growth could reach or exceed the overall average growth rate at 6.9% per year. The average growth rate of the bottom half population was 4.9 % per year. The allowance for the urban-rural cost of living difference (CLD=0 or 10%) makes little difference.

In China, the poor benefited far less than the rich from growth

Figure 1. Income growth rates for each income percentile, China, 1990-99



Note: To calculate the growth rate for the p'th percentile, we first estimate the slope of the ordinary Lorenz curve by taking the first derivative of the Villasenor-Arnold " General Elliptical" Lorenz function (Datt, 1991) calibrated to 1990 and 1999 income distributional data. This satisfied the theoretical conditions for a valid Lorenz curve and the fit was exceptionally good. We estimated the slope at 99 point, to obtain growth rates by percentile. we have done two version here, one assuming no difference in the cost of living between rural and urban areas (CLD=0) and other assuming 10 % difference (CLD=10%). The graph has been smoothed based on 99 points. Source: authors' calculation.

4. Human capital, Growth and Poverty Reduction[5]

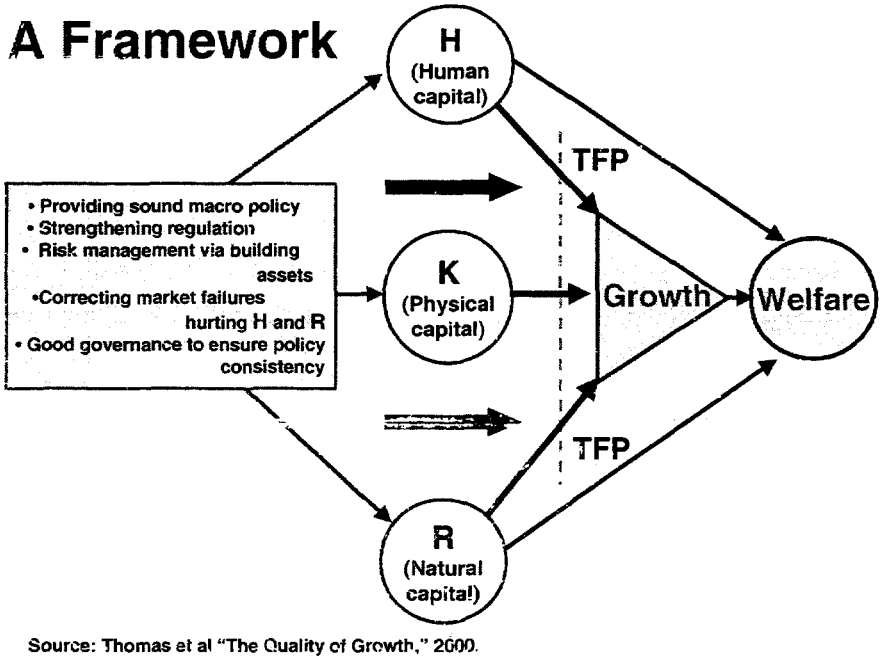
The main asset of most poor people is their human capital. Investing in the human capital of the poor is a powerful way to augment their assets, redress asset inequality and reduce poverty. Therefore in this section, we attempt to examine the relationship between human capital, growth and poverty reduction, associating human capital accumulation and its distribution with poverty reduction, and thereby provide some preliminary assessments of a set of pro-growth policies.

Figure 1 lays out a simple framework for policy discussions. Broadly speaking, a country has at least three types of asset that matter for production and welfare: physical capital, human capital, and natural capital. Technological progress and the policy environment affecting the use of these assets matter as well. For accelerating growth rates, much attention has traditionally gone to the accumulation of physical capital. But for poverty reduction, other key assets also deserve attention—human (and social) capital as well as natural (and environmental) capital.

Physical capital contributes to welfare through economic growth. Human (and social) capital and natural (and environmental) capital not only contribute to growth; they are also direct components of welfare. Human and natural capital also help to increase the investment returns r_f, thereby attracting more foreign capital and making the investment more productive. Adding to all this, investments in physical, human, and natural capital, together with many policy reforms, contribute to technological progress and the growth of total factor productivity, thereby boosting growth.

[5] This section draws heavily from Yan Wang's Chapter in The Quality of Growth, and her paper with Yudong Yao 2001, "Sources of China's Economic Growth 1952-1999: Incorporating Human Capital Accumulation".

Figure 2. A framework for equitable and sustainable growth



Source: Revised based on Thomas et al , The Quality of Growth, 2000.

For the purpose of poverty reduction, augmenting the poor's human capital is crucial because it is the poor's main asset. Yet, inequality in the distribution of human capital is staggering among developing countries. Thomas, Wang and Fan (2001) estimated the education gini index for 85 countries and found significant differences in the distribution of schooling, with the gini index ranging from 90% in Mali, to 15% in Korea. Korea had the fastest expansion in education coverage and the fastest decline in the education gini index; it dropped from 51% to 15% in 25 years. India's education gini declined only moderately, from 80% in 1970 to 69% in 1990.

What has been the trend for China's human capital accumulation and its distribution? And how does this relate to growth, and hence poverty reduction? Past studies have used enrollment rates to measure China's human capital, but this approach is problematic. In many growth accounting exercises on China, human capital was ignored completely. Recently, we constructed a unique measure of China's human capital, and used it in a new growth accounting exercise. The follow results emerge from our analysis.

First, using the perpetual inventory method, following Barro and Lee (1997), we constructed the average years of schooling attainment for the population age 15 to 64.[6] Figure 3 shows the human capital stock series we constructed over the period 1952-1999. We found that there is a rapid accumulation of human capital for the working population. The sharp increase of the human capital stock for the period 1976-1980, perhaps reflects the recovery from the distorted education system caused by the Cultural Revolution (1966-1976) to a normal education system. However, human capital accumulation slowed down in the reform period since 1978, with its annual growth rates declined from 5.3% before the reform to 2.7% after the reform.

Second, using a simple growth accounting framework incorporating human capital, we found that human capital contributed positively and significantly to economic growth, in both pre-reform and reform periods. Keeping other factors constant, human capital accumulation accounted for 32.8% of the growth in the pre-reform period, and 13.8% of the growth in the reform period. This implies that when the economy was closed and policies were distorted in the pre-reform period, the accumulation of human capital had played a more important role in supporting growth, together with accumulation of physical capital. In the reform period, the growth of total factor productivity played a more important role. For methodology see annex 3.

Table 4: Sources of Economic Growth (in percent)

	Pre-reform Period 1953-77 Labor Share=0.40	Reform Period 1978-99 Labor share=0.50
Average Annual Growth Rate (%)		
Output	6.46	9.72
Physical Capital Stock	6.11	9.39
Labor Quantity	2.63	2.73
Human Capital Stock	5.30	2.69
TFP	-0.57	2.32
Contribution to GDP growth by factor		
Contribution of physical capital\[a]	56.8	48.3
Contribution of labor quantity\[a]	16.3	14.0
Contribution of human capital\[a]	32.8	13.8
Contribution of productivity growth\[b]	-5.9	23.9

Note: This table reports the growth decomposition corresponding to equation 2.
a. Ratio of input growth weighted by the corresponding factor income share, to GDP growth.
b. Ratio of TFP growth to GDP growth.

Source, Yan Wang and Yudong Yao, 2001.

[6] We use data on the distribution of educational attainment at different levels, combined with information on the national duration of school at each level, to generate the number of years of schooling achieved by the average person at the various levels and at all levels of schooling combined. See Wang and Yao 2001 for details.

Third, total factor productivity grew rapidly only in the reform period. In the pre-reform period, TFP growth was negative, confirming the fact that the growth was entirely due to factor accumulation, with no productivity improvement. After reform, the institutional changes in the rural and urban sector, the opening of the economy to international trade and foreign capital flows have led to efficiency gains due to improved incentives, rational prices, new technological progress, and less distorted policy environment. These factors are conducive to growth as well as to poverty reduction.

Fourth, there is a huge regional disparity in human capital stock, and the distribution of education is increasingly skewed. This is a matter of concern. Figure 4 shows that the average years of schooling among Chinese provinces range from 3.5 year to 8 or 9 years, and the distribution of education measured by the gini index ranges from very equal 0.15 to less equal, 0.45. This figure excludes a few provinces such as Hainan and Tibet due to lack of data. The dispersion would be larger had these provinces been included. Figure 5 shows the standard deviation on the average years of schooling across provinces. We can see the standard deviation increased sharply after 1995, and continue until today. This implies that the regional disparity is not being reduced but continuing to widen.

The unequal distribution of human capital represents a huge loss in social welfare. Assuming the distribution of ability is normal, if the distribution of education opportunities are more skewed than the distribution of ability. The society suffers from undeveloped human capital and under utilization of its potential human capital. This would have a negative impact on growth as well as on social welfare directly. According to econometric analysis using household survey data, real income per capita is positively and significantly related to all levels of education. Thus, a lower level of school attainment would have hurt the poor and their opportunity of being lifted out of poverty (Ravallion and Chen 1998).

There might be many reasons for this widening regional inequality in education opportunities, ranging from lower income and lower demand for schooling (demand side factors); to insufficient fiscal transfers to the poor regions (supply side factors). Whatever the reason, this issue should be addressed if China is to reduce its poverty and inequality.

5. Conclusion

This paper investigates the recent trends in poverty and income distribution since the 1990, distinguishing between the pre-crisis and the after- crisis periods. To contributing to the recent debate, we also attempt to decompose poverty reduction into two parts, one attributable to growth and the other attributable to inequality. Then we investigate the issue of how much the poor benefit from growth.

We found that despite past progress, both internal and external factors have led to a slowdown in China's export and economic growth between 1997-1999, which in turn might have adversely affected the poor: There was a slight increase in the poverty headcount between 1997-99 using lower poverty lines, and a worsening of poverty gap index. The real average per capita consumption declined for farmers, especially for those living in the poor

regions such as Gansu, Heilongjiang, Shanxi, and Xinjiang. However, it remains unclear to what degree this decline was due to financial crises in Asia.

Second, during the period from 1990 to 1999, there was a significant worsening of both rural and urban income distributions. During the Asian crisis however, it has remained relatively stable.

Third, after decomposing the poverty reduction into two parts, we found that economic growth contributed significantly to poverty reduction, while a rising inequality has increased poverty, except for one period. Moreover, the poor benefited much less than the rich from the economic growth, and it was only the top 20 percent of the population whose income growth had reached or exceeded the average growth rate.

Finally, we examine the relationship between human capital, growth and poverty. Our preliminary results show that the accumulation of human capital had slowed during the reform period and contributed less to economic growth than that for pre-reform period. There is a huge regional disparity in human capital stock across province, and the distribution of education is becoming increasingly skewed. This is a matter of concern as human capital is the poor's main asset, and education is positively and significantly related to growth and poverty reduction. This issue should be addressed if China is to succeed in its efforts to attack poverty and inequality.

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Annex 1. Methodology and Poverty Gap

Table A1 Headcount index based on consumption expenditure, available years

China: headcount index (based on expenditure distribution)

	Rural					Urban				National		
Poverty Lines z/day	1990	1992	1996	1998	1999	1996	1997	1998	1999	1996	1998	1999
0.50	6.9	4.0	1.07	1.3	1.7	0.0	0.0	0.0	0.0	0.8	1.2	1.2
0.75	28.1	20.5	10.58	12.1	12.8	0.2	0.2	0.0	0.2	7.5	8.9	8.9
1.00	51.7	41.4	24.8	26.2	27.0	0.4	0.4	1.0	0.5	17.6	18.9	18.8
1.25	70.4	61.5	39.55	40.9	41.4	1.1	1.1	2.0	1.1	28.2	29.2	29.0
1.50	81.8	75.7	52.98	54.0	54.2	2.6	2.7	3.7	2.4	38.2	38.5	38.2
1.75	88.2	84.4	64.02	64.7	64.6	5.5	5.6	6.4	4.6	46.8	46.4	46.1
2.00	91.9	89.5	72.49	72.9	72.6	9.7	9.7	9.9	7.7	54.0	52.9	52.6
2.25	94.2	92.6	78.77	79.0	78.6	14.7	14.5	14.2	11.6	60.0	58.2	57.9
2.50	95.7	94.6	83.38	83.4	83.1	20.3	19.8	19.0	16.0	64.9	62.7	62.3

Table A2. Poverty Gap index based on consumption expenditure, available years

China: Poverty Gap index (based on expenditure distribution)

	Rural					Urban				National		
Poverty lines z/day	1990	1992	1996	1998	1999	1996	1997	1998	1999	1996	1998	1999
0.50	1.1	0.6	0.146	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.2
0.75	6.433	4.315	1.746	2.073	2.327	0.1	0.1	0.0	0.1	1.2	1.4	1.6
1.00	14.8	10.9	5.444	5.9	6.3	0.1	0.1	0.4	0.1	3.9	4.2	4.4
1.25	24.2	19.1	10.799	11.5	11.9	0.2	0.2	0.6	0.3	7.7	8.2	8.3
1.50	32.9	27.4	16.738	17.5	17.9	0.5	0.5	1.0	0.5	12.0	12.5	12.6
1.75	40.4	35.0	22.735	23.5	23.9	1.0	1.0	1.5	0.9	16.3	16.8	16.8
2.00	46.6	41.5	28.45	29.2	29.5	1.8	1.8	2.3	1.6	20.6	21.0	20.9
2.25	51.8	47.0	33.71	34.4	34.7	2.9	3.0	3.4	2.5	24.7	25.0	24.7
2.50	56.1	51.7	38.458	39.1	39.3	4.4	4.4	4.7	3.6	28.5	28.7	28.3

Table A3. on poverty gap index based on income, 1990-99

China: Rural Poverty gap index (based on income distribution)

z/day	1990	1992	1993	1994	1995	1996	1997	1998	1999
0.50	1.4	1.6	2.1	2.2	1.7	0.9	1.3	1.1	1.2
0.75	5.7	6.0	6.4	6.0	5.0	3.0	3.5	3.2	3.5
1.00	12.4	12.3	12.7	11.4	9.5	6.7	7.1	6.9	7.3
1.25	20.3	19.7	19.9	17.6	15.1	11.5	11.8	11.6	12.1
1.50	28.1	27.2	27.1	24.2	21.1	16.8	16.9	16.9	17.4
1.75	35.3	34.1	33.8	30.7	27.1	22.2	22.2	22.3	22.7
2.00	41.5	40.2	39.7	36.6	32.7	27.5	27.3	27.6	28.0
2.25	46.8	45.5	44.9	41.7	37.8	32.5	32.3	32.6	32.9
2.50	51.4	50.1	49.5	46.3	42.4	37.1	36.9	37.5	37.5

China: Urban Poverty Gap index (based on income distribution)

z/day	1990	1992	1993	1994	1995	1996	1997	1998	1999
0.50	0	0	0	0	0	0	0	0	0
0.75	0	0	0.1	0.1	0.1	0.1	0.1	0.0	0.1
1.00	0.0	0.3	0.2	0.2	0.2	0.1	0.2	0.4	0.2
1.25	0.5	0.5	0.4	0.5	0.3	0.3	0.3	0.6	0.3
1.50	1.5	0.9	0.8	0.9	0.6	0.5	0.6	0.9	0.5
1.75	2.9	1.5	1.6	1.7	1.2	1.0	1.0	1.4	0.9
2.00	4.7	2.6	2.7	2.9	2.0	1.8	1.8	2.2	1.4
2.25	6.9	4.2	4.3	4.4	3.1	2.9	2.9	3.1	2.2
2.50	9.5	6.2	6.2	6.1	4.5	4.3	4.2	4.3	3.2

China: National Poverty Gap index (based on income distribution)

z/day	1990	1992	1993	1994	1995	1996	1997	1998	1999
0.50	1.0	1.2	1.5	1.6	1.2	0.7	0.9	0.8	0.8
0.75	4.2	4.3	4.6	4.3	3.6	2.2	2.5	2.2	2.4
1.00	9.2	9.0	9.2	8.2	6.8	4.8	5.0	4.9	5.1
1.25	15.1	14.4	14.4	12.7	10.8	8.2	8.3	8.3	8.4
1.50	21.1	19.9	19.7	17.5	15.2	12.0	12.0	12.1	12.1
1.75	26.7	25.1	24.7	22.4	19.6	16.0	15.9	16.0	16.0
2.00	31.8	29.8	29.3	26.9	23.8	19.9	19.7	19.9	19.8
2.25	36.3	34.1	33.5	31.0	27.7	23.8	23.5	23.7	23.4
2.50	40.3	37.9	37.3	34.8	31.4	27.5	27.1	27.4	26.9

Source: authors.

Table A4. Gini index based on consumption distributions, available years

Gini index (%) of consumption distributions

	Rural	Urban	National		
			CLD=0	CLD=10%	CLD=20%
1990	30.57				
1992	32.13				
1993					
1994					
1995					
1996	33.62	29.09			
1997		30.03			
1998	34.48	31.52	42.85	41.26	39.93
1999	35.39	31.55	44.50	42.87	41.49

Source: authors. Blanks mean data not available.

Annex 2. China's Rural Consumption and Poverty Incidences

Table A5: Changes in per capita living expenditure for rural households, 1996-99

	96-99 (%)	96-97 (%)	97-98 (%)	98-99 (%)
Beijing	12.23	-0.29	4.21	8.02
Tianjin	-4.06	-6.73	5.54	-2.55
Hebei	-3.36	-3.57	-5.10	5.60
Shanxi	-10.76	-5.30	-6.36	0.63
Inner Mongolia	4.05	4.01	1.94	-1.87
Liaoning	-7.40	-0.58	-3.64	-3.35
Jilin	-12.00	3.48	-8.47	-7.10
Heilongjiang	-10.47	-2.92	-5.17	-2.75
Shanghai	-4.19	6.33	-0.50	-9.44
Jiangsu	-4.79	1.02	-5.12	-0.66
Zhejiang	4.02	2.92	2.54	-1.43
Anhui	0.90	1.37	-0.16	-0.30
Fujian	6.56	2.90	2.06	1.48
Jiangxi	3.22	-0.16	-2.94	6.52
Shandong	1.69	-3.89	-0.93	6.80
Henan	-1.51	1.36	0.54	-3.35
Hubei	-4.66	-2.08	3.40	-5.84
Hunan	5.37	2.00	3.94	-0.62
Guangdong	5.25	-0.20	4.49	0.93
Guangxi	8.72	-2.45	6.24	4.90
Hainan	3.77	-0.45	0.23	4.00
Chongqing	-0.10	n.a.	0.25	-0.36
Sichuan	2.14	1.63	0.52	-0.02
Guizhou	-2.45	-3.50	3.10	-1.95
Yunnan	-0.76	4.92	-1.52	-3.95
Tibet	-1.25			7.47
Shaanxi	4.10	6.48	-2.12	-0.12
Gansu	-10.66	-3.81	-2.69	-4.55
Qinghai	2.77	-1.02	1.97	1.82
Ningxia	1.40	-2.29	6.46	-2.51
Xinjiang	-6.06	-0.29	3.14	-8.65

Source: calculated based on data from SSB: China Statistical Yearbook, 1997-2000.

Table A6 : China rural poverty incidences by provinces, 1996

	Mean exp.	Headcount						
	(Yuan)	< 438Y	< 580Y	<657Y	<700Y	<788Y	<876Y	<1094Y
(1993 PPP $/day)		$ 0.505	$0.67	$ 0.755	$0.80	$0.90	$1	$1.255
			(Gov. poverty line)					
Rural China	1572.00	3.51	**8.59**	12.24	14.52	19.37	**24.11**	36.67
Beijing	2564.51	0.63	**1.38**	2.05	2.54	3.79	**5.39**	10.76
Tianjin	1957.39	0.32	**0.97**	1.72	2.35	4.12	**6.60**	15.25
Hebei	1398.94	3.60	**9.19**	13.02	15.36	20.28	**25.38**	38.33
Shanxi	1174.29	4.52	**13.03**	18.11	21.32	28.34	**35.97**	55.30
Inner Mongolia	1437.62	4.28	**8.94**	11.98	13.90	18.16	**22.99**	37.16
Liaoning	1763.57	1.44	**3.69**	5.71	8.22	10.94	**14.01**	23.33
Jilin	1513.19	3.86	**8.67**	12.00	14.08	18.48	**23.13**	33.74
Heilongjiang	1537.30	6.04	**10.14**	12.74	14.36	17.90	**21.86**	33.40
Shanghai	3867.84	<.1	**<.1**	<.1	0.47	0.63	**0.84**	1.69
Jiangsu	2414.43	<.1	**0.10**	1.67	2.68	4.80	**7.08**	13.50
Zhejiang	2701.69	<.1	**0.60**	1.99	2.82	4.55	**6.40**	11.52
Anhui	1309.35	0.63	**4.57**	7.75	10.31	16.00	**22.43**	40.65
Fujian	1913.25	0.34	**0.90**	1.53	2.04	3.53	**5.75**	14.32
Jiangxi	1553.10	0.29	**0.96**	1.86	2.67	5.18	**9.01**	23.04
Shandong	1652.51	0.10	**3.45**	5.63	7.01	10.07	**13.58**	24.40
Henan	1206.43	2.45	**7.71**	12.42	15.61	21.24	**28.34**	49.01
Hubei	1636.41	0.71	**2.73**	4.90	6.50	10.32	**14.77**	26.06
Hunan	1736.71	0.22	**0.89**	2.87	3.97	5.13	**8.64**	18.54
Guangdong	2584.16	0.10	**0.22**	0.42	0.61	0.11	**2.37**	7.81
Guangxi	1399.07	2.68	**8.36**	12.67	15.37	21.09	**25.24**	40.08
Hainan	1288.98	5.79	**13.91**	18.99	21.99	28.06	**33.16**	48.39
Chongqin	1349.88	1.84	**5.95**	9.61	12.09	16.77	**22.61**	39.59
Sichuan	1349.88	1.72	**5.81**	9.48	11.95	17.11	**22.91**	39.46
Guizhou	1068.09	6.09	**15.09**	21.46	25.43	33.90	**42.70**	62.86
Yunnan	1209.16	8.94	**18.25**	23.69	26.88	33.35	**39.80**	54.83
Tibet	773.02	17.22	**36.30**	46.98	52.76	63.08	**71.43**	84.68
Shaanxi	1097.59	7.12	**14.81**	20.25	23.71	31.27	**39.44**	59.52
Gansu	986.34	11.33	**21.94**	28.87	33.12	42.00	**50.87**	69.62
Qinghai	1052.33	8.02	**17.08**	23.07	26.81	34.84	**43.26**	62.89
Ningxia	1235.67	9.83	**18.45**	23.43	26.35	32.27	**38.20**	52.28
Xinjiang	1346.57	13.22	**21.23**	25.67	28.23	33.34	**38.37**	50.24

Annex 3: Methodology for Section 4: on growth accounting framework

Growth accounting essentially divides output growth into a component that can be explained by input growth, and a 'residual' which captures changes in productivity. Consider the following aggregate production function for the Chinese economy:

$$Y_t = A_t K_t^{1-\alpha} (L_t H_t)^{\alpha} \quad (1)$$

where Y_t is real GDP, At is total factor productivity, K_t is the real capital stock, L_t is total employment, H_t is average schooling years of population age 14-65 and represents human capital stock. Hence $L_t H_t$ is a skill-adjusted measure of labor input. Taking logs and differentiating totally both sides of equation (1) yields

$$a_t = g_t - (1-\alpha)\hat{k}_t - \alpha(\hat{l}_t + \hat{h}_t) \quad (2)$$

where a_t is growth in Total Factor Productivity (TFP), g_t is the growth rate of real GDP, the lowercase variables with a "hat" correspond to the growth rate of the uppercase variables described in equation (1). Equation (2) decomposes the growth rate of output into growth of TFP, and a weighted average of the growth rates of physical capital stock and skill-augmented labor. Under the assumption of constant returns to scale, these weights are given by the shares of these two inputs in aggregate output. TFP is called "measure of our ignorance" by some economist, as it covers many components: innovation-based technology progress, imitation-led technology progress, institutional change, efficiency change, omitted variables and measurement errors. TFP should not be equated with innovation-based technology chance, although it often is. It is important to note that the decomposition of equation (2) remains valid under more general functional forms of the production function such as translog production function used by Hu and Khan (1997) and Young (2000). The interpretation of the weights on physical capital and skill-augmented labor as their share in aggregate output requires only the assumption of constant returns to scale. The Cobb-Douglas production function is chosen for simplicity.
Our results of growth accounting are shown in Table 4.

Figure 3. Accumulation of human capital in China, 1952-1999
Source: Wang and Yao, 2001

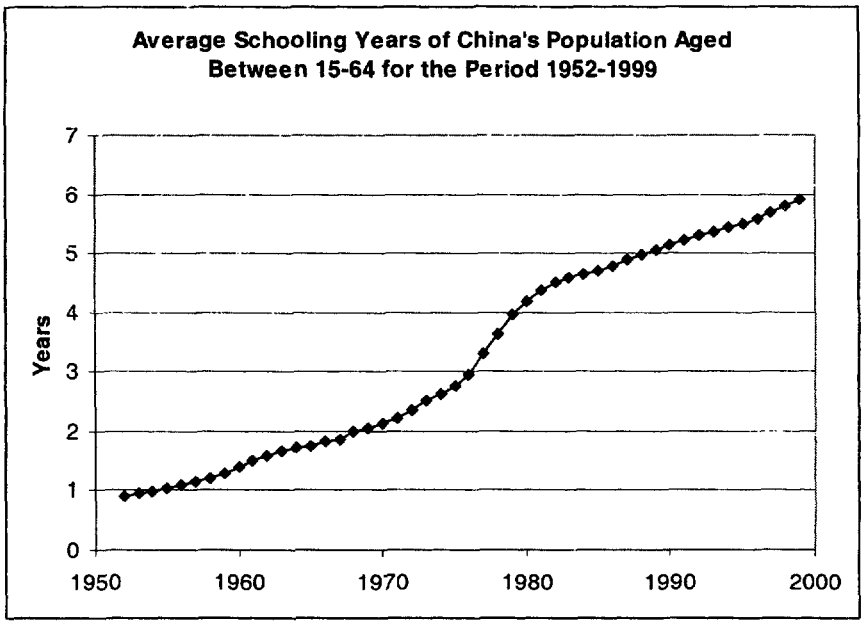
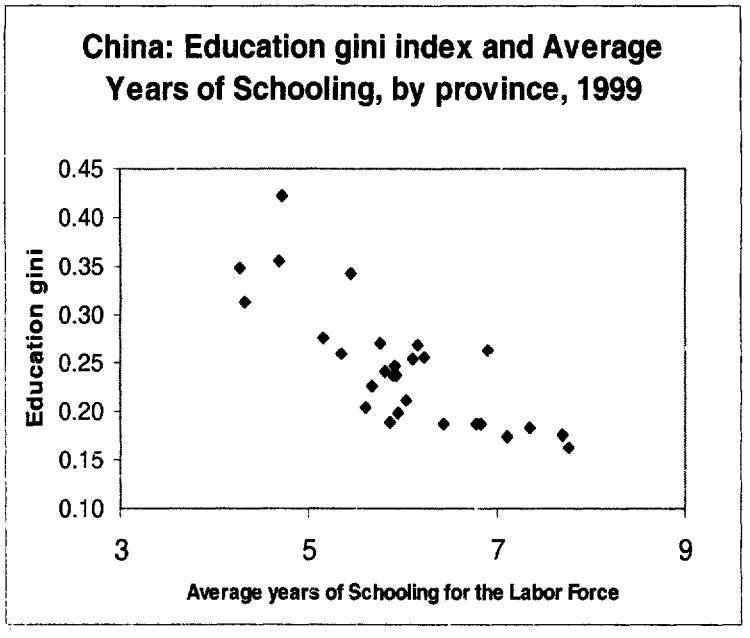
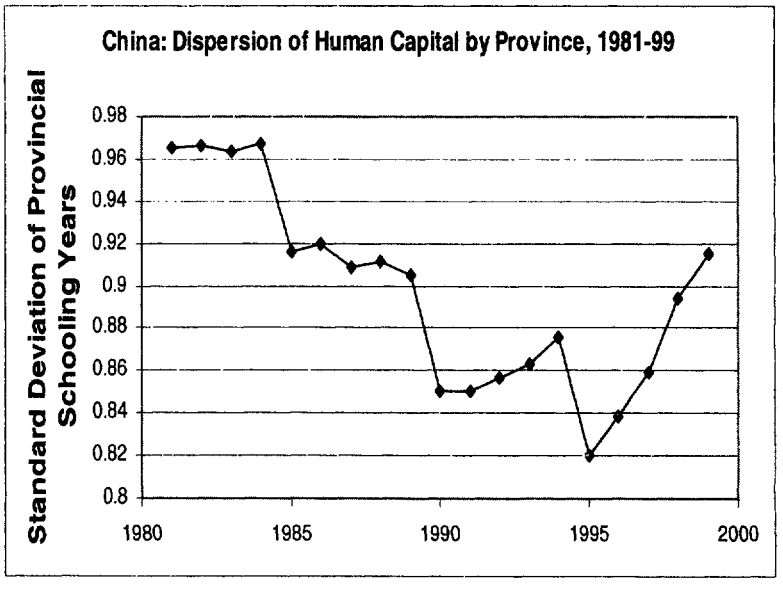


Figure 4. China: Regional Disparities in Education and its distribution



Source: Wang and Yao 2001.

Figure 5. Dispersion of human capital by province



Source: Wang and Yao, 2001.

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